

Cosmic Chemistry: Cosmogony

Dark Matter— More Than Meets The Eye

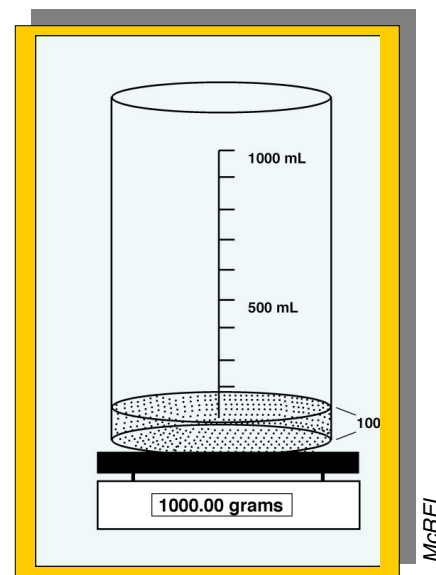
TEACHER GUIDE: POWERPOINT PRESENTATION

BACKGROUND INFORMATION

The PowerPoint presentations that are provided as Genesis educational technology applications should be used as a supplement to the student texts from which they were derived. They offer an alternative way of assisting student learning of information contained in the text.

In constructing PowerPoint presentations, adding too much text to the slide is not visually pleasing to the student. Because sharing slide notes is vital for complete understanding of the concepts, notes are provided for the teacher. Therefore it is important to read and print out the slides and the teacher talking points that accompany them.

While showing the slides to your students, we encourage you to use the teacher talking points that accompany the slides. Ask the students to consider the graphics that are on each slide. The images and graphs that accompany the text will generate questions that can be explored further, either in the student text itself or with additional research.



NATIONAL SCIENCE STANDARDS ADDRESSED

Teaching Standards

Teaching Standard A: Teachers of science plan an inquiry-based science program for their students

Select science content and adapt and design curricula to meet the interests, knowledge, understanding, abilities and experiences of students.

Select teaching and assessment strategies that support the development of student understanding and nurture a community of science learners.

Teaching Standard B: Teachers of science guide and facilitate learning

Focus and support inquiries while interacting with students.

Orchestrate discourse among students about scientific ideas.

Encourage and model the skills of scientific inquiry, as well as the curiosity, openness to new ideas, and skepticism that characterize science.

Teaching Standard D: Teachers of science design and manage learning environments that provide students with the time, space, and resources needed for learning science

Create a setting for student work that is flexible and supportive of science inquiry.

Make the available science tools materials, media, and technological resources accessible to students.

Content Standards

Grades 5-8

Science As Inquiry

Understandings about scientific inquiry

Physical Science

Properties and changes of properties in matter

Science and Technology

Understandings about science and technology

[History and Nature of Science](#)

Science as a human endeavor
Nature of science and scientific knowledge

Grades 9-12[Science As Inquiry](#)

Understandings about scientific inquiry

[Earth and Space Science](#)

The origin and evolution of the universe

[Physical Science](#)

Structure of atoms

[Science and Technology](#)

Understandings about science and technology

[History and Nature of Science](#)

Nature of science and scientific knowledge
Historical perspectives

(View a full text of the [National Science Education Standards](#).)

MATERIALS

For the Teacher

- Computer with Microsoft® PowerPoint application
- Computer projector or overhead projector with LCD Panel
- “Dark Matter—More Than Meets The Eye” PowerPoint presentation

For each student

- Copy of [Student Text, “Dark Matter—More Than Meets The Eye”](#)

PROCEDURE

- The “Dark Matter—More Than Meets The Eye” student text is to be used with the activity in the Genesis science education module [Cosmic Chemistry: Cosmogony](#).
- If your students are not familiar with the concept of a discrepant event, you may want to complete the alternate strategy tip found in the “Dark Matter—More Than Meets The Eye” teacher guide as a demonstration prior to the PowerPoint.
- Show slide 2, the beaker with 100 mL. of water on a balance can be used during the second procedure in the teacher’s guide that accompanies the activity “Dark Matter-More Than Meets the Eye.” Once students have looked at this slide, ask them to answer the following questions:
 - a) What possible explanations might there be for what was observed?
 - b) What might we do to determine the cause of this phenomenon?
 - c) On what basis might we decide whether or not we have determined the correct reason for this phenomenon?
- Hand out copies of the Student Text, “Dark Matter—More Than Meets the Eye,” and assign it as student reading to be completed before the next class session.
- Use the PowerPoint, Student Text, and Genesis Glossary to help students answer the following questions. Suggested resources to assist students are provided in brackets. Suggested answers are found in the “Dark Matter—More Than Meets the Eye,” teacher guide.
 - a) What is dark matter? [Genesis Glossary]
 - b) What is another term used to describe dark matter? [Slide 10]
 - c) How much of the matter in the universe actually gives off light? [Slides 6, 11]
 - d) If dark matter does not give off light, how was it discovered? [Slides 3, 4, 5]
 - e) How willing are scientists to accept what the observations appear to be discrepant events? What usually has to occur before these observations are accepted? [Student Text.]



- f) What types of technology have been used to observe dark matter? [Slides 8, 9, 10]
- g) Can dark matter and light matter coexist in the same space or parts of the universe? [Refer to the activity “The Push and Pull of the Universe”]
- h) If you had a box that was filled with marbles and basketballs, which of them do you think would model bright, luminous matter and which would model dark matter?
- i) In “The Spongy Universe” activity, we found that one of the basic precepts of the standard cosmological model is that the universe is isotropic and homogeneous. How does the discovery of dark matter support or contradict this precept?[Slide 7]
- j) What is the difference between MACHOs and WIMPs? What are some examples of MACHOs and WIMPs that we have studied in previous activities? Are we made of MACHOs and WIMPs? [Slide 12]
- k) Based on the evidence that we have now, what do you think that dark matter is made of?[Slide 13 and student text]

TEACHER RESOURCES

<http://www.genesismission.org/educate/kitchen/techappl/invigor.html>

Invigorate Your Presentations

<http://www.astro.queensu.ca/~dursi/dm-tutorial/dmo.html>

This Canadian site offers information about several cosmological theories, and also has a detailed section on dark matter.

http://imagine.gsfc.nasa.gov/docs/features/news/grav_lens.html

An explanation of gravitational lensing can be found at this site.